AMENDMENTS TO THE CLAIMS

The listing of claims below replaces all prior versions of claims in the application.

1. (Currently Amended): A tandem linear ion trap and time-of-flight mass spectrometer, the ion trap having a straight central axis orthogonal to the flight path of said time-of-flight mass spectrometer and comprising;

a set of electrodes, at least one said electrode having a slit for ejecting ions towards said time-of flight mass spectrometer;

a set of [[DC]] voltage supplies to provide <u>only</u> discrete DC levels for trapping ions, for optimizing the distribution of the trapped ions, and for ejecting the trapped ions from the ion trap and a number of fast electronic switches for connecting and disconnecting said DC supplies to at least two said electrodes of said ion trap;

a neutral gas filling the volume of said ion trap in order to reduce the kinetic energy of trapped ions towards equilibrium;

a digital controller to provide a switching procedure for ion trapping, manipulations with ions, cooling and including one state at which all the trapped ions in the ion trap are ejected from said ion trap ~~towards~~ <u>along the flight path to</u> said time-of-flight mass spectrometer.

2. (Previously Presented): A tandem linear ion trap and time-of-flight mass spectrometer according to claim 1, wherein said set of electrodes comprises 4 elongated electrodes arranged

symmetrically with respect to each other, and arranged to be parallel with respect to an ion trap axis.

3. (Original): A tandem linear ion trap and time-of-flight mass spectrometer according to claim 2, wherein said at least one electrode having a slit for ejecting ions has a surface of substantially hyperbolic shape with the centre of said slit positioned symmetrically with respect to the apex of said hyperbola.

4. (Previously Presented): A tandem linear ion trap and time-of-flight mass spectrometer according to claim 1 wherein said neutral gas has a molecular mass smaller than the mass of ions of interest and said ion trap is filled with said neutral gas to a pressure in the range from 0.01mTorr to lmTorr.

5. (Original): A tandem linear ion trap and time-of-flight mass spectrometer according to claim 1, wherein said digital controller includes a digital processor capable of calculating an arbitrary switching sequence and control means to control a set of said number of said fast electronic switches according to said arbitrary switching sequence.

6. (Original): A tandem linear ion trap and time-of-flight mass spectrometer according to claim 1, wherein said switching procedure includes a final step during which the voltages on said electrodes of said ion trap are periodically switched between a set of states and after a time

sufficient for ion cooling the voltages on said electrodes of said ion trap are switched to a final said state for ejection of said ions from said ion trap.

7-9. (Cancelled)

10. (Previously Presented): A tandem linear ion trap and time-of-flight mass spectrometer according to claim 1 wherein the flight path of said time-of-flight mass spectrometer is positioned inline with the ejection path of ions.

11. (Currently Amended): A tandem linear ion trap and time-of-flight mass spectrometer ~~as claimed in claim 1~~, the ion trap having a straight central axis orthogonal to the flight path of said time-of-flight mass spectrometer and comprising:

a set of electrodes, at least one said electrode having a slit for ejecting ions towards said time-of-flight mass spectrometer;

a set of voltage supplies to provide only discrete DC levels for trapping ions, for optimizing the distribution of the trapped ions, and for ejecting the trapped ions from the ion trap and a number of fast electronic switches for connecting and disconnecting said DC supplies to at least two said electrodes of said ion trap;

a neutral gas filling the volume of said ion trap in order to reduce the kinetic energy of trapped ions towards equilibrium;

a digital controller to provide a switching procedure for ion trapping, manipulations with ions, cooling and including one state at which all the trapped ions in the ion trap are ejected from said ion trap along the flight path to said time-of-flight mass spectrometer;

wherein an opposite pair of electrodes (Y pair) of said set of electrodes is connected to a first subset of said number of said fast electronic switches capable of switching at a repetition rate, and at least one of another oppositely positioned pair of electrodes (X pair) of said set of electrodes is connected to a second subset of said number of said fast electronic switches which has a higher voltage rating, said second subset of fast electronic switches connects said DC voltage supply to said X electrodes for ejection of said ions.

12. (Original): A tandem linear ion trap and time-of-flight mass spectrometer as claimed in claim 11, wherein said first subset of said number of said fast electronic switches includes 2 serially linked high repetition switches, switching between a positive and negative voltage to provide said Y pair of electrodes of said set of electrodes with a rectangular waveform.

13. (Previously Presented): A tandem linear ion trap and time-of-flight mass spectrometer as claimed in claim 11, wherein the value of the voltage provided to said electrodes is above 4 kV or below -4kV.

14. (Currently Amended): A method of extracting ions from a linear ion trap, said ion trap being driven by a set of digital switches, said method comprising the following steps[[;]]:

trapping said ions in said ion trap by switching fast between a set of trapping states defined by discrete DC levels applied ~~a set of voltage states~~ on the electrodes of said ion trap;

cooling said trapped ions by collisions with a buffer gas down to equilibrium[[:]];

and switching from a pre-selected trapping state to a final ejection state in condition of pure electrostatic field within the ion trap in a pre-selected time by elongating the switching period of the trapping states.

15. (Previously Presented): A method of extracting ions from a linear ion trap as claimed in claim 14, where said set of trapping states consists of two states, each of said states lasts for half of a set period.

16. (Previously Presented): A method of extracting ions from a linear ion trap as claimed in claim 14, wherein said buffer gas fills said ion trap at pressures in the range from 0.01mTorr to lmTorr.

17. (Original): A method of extracting ions from a linear ion trap as claimed in claim 15, wherein said set period is in the range from 0.3 micro seconds to 1.0 micro seconds.

18. (Previously Presented): A method of extracting ions from a linear ion trap as claimed in claim 15, where the final trapping state prior to said ejection state has a duration of approximately one quarter of said set period.

19-20. (Cancelled)